Crew integration & Automation Testbed
and
Robotic Follower Programs

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Abstract

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Number of Pages
11

TARDEC Crew Reduction Efforts

FY93

FY96

Crewman's Associate Simulation

FY98

System Integration (Lab)

FY00

Vehicle Tech Demo #1 (VTT)

FY04

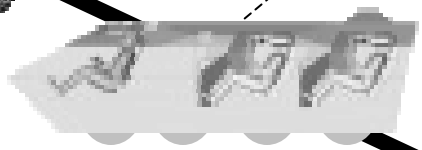
Vehicle Tech Demo #2 (CAT ATD)

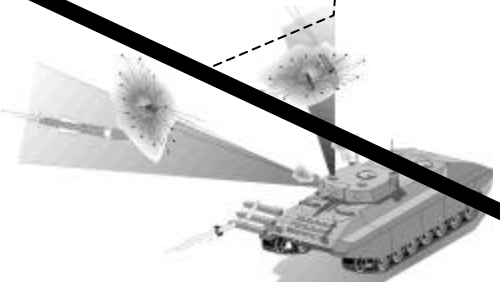
FY06

Two Man Transition

Future Combat System

Baseline Developed





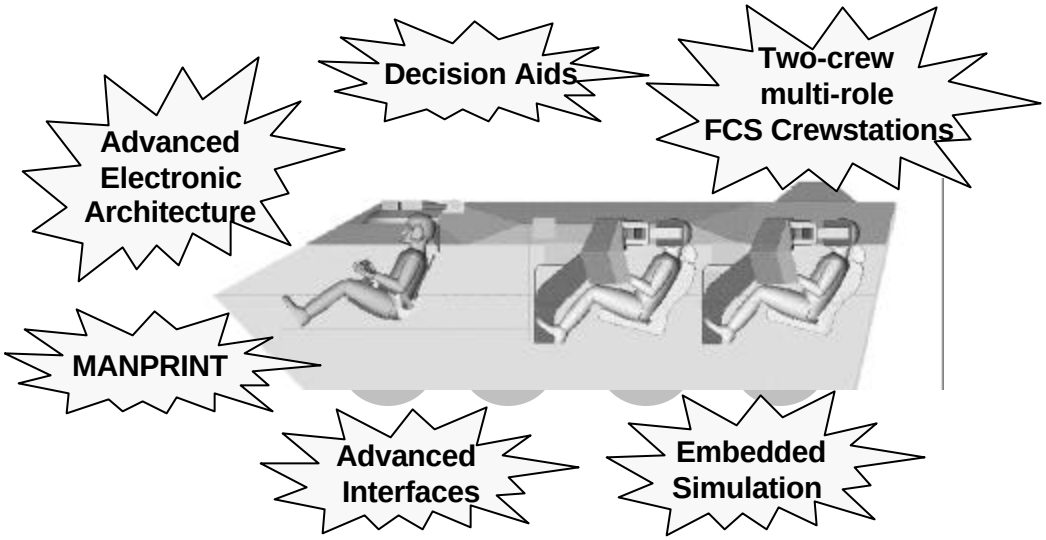
"Evolving Technologies for Reduced Crew Operation"

Crew integration and Automation Testbed

- Objectives:
  - Demonstrate the crew interfaces, automation, and integration technologies required to operate and support future combat vehicles.
  - Demonstrate crew stations enabling two-crew operation of multi-mission capable, C-130 transportable systems required for the objective force of the Army.

- Status:
  - In Year #2 of 4-Year ATD Program
  - Active Crew Task Analysis IPT between MMBL, ARL and TARDEC
  - Active Architecture IPT with STO/ATD Managers
  - SMI Working Group Approved with Future Combat Systems

Crew integration and Automation Testbed



Concept Vehicle Shown **with Onboard Safety Driver**

Demonstrate the crew interfaces, automation, and integration technologies required to operate and support Future Combat Systems

Pacing Technologies:

- Decision Aids
- Soldier-Machine Interface
- Embedded Simulation
- Electronics Architecture

Warfighter Payoffs:

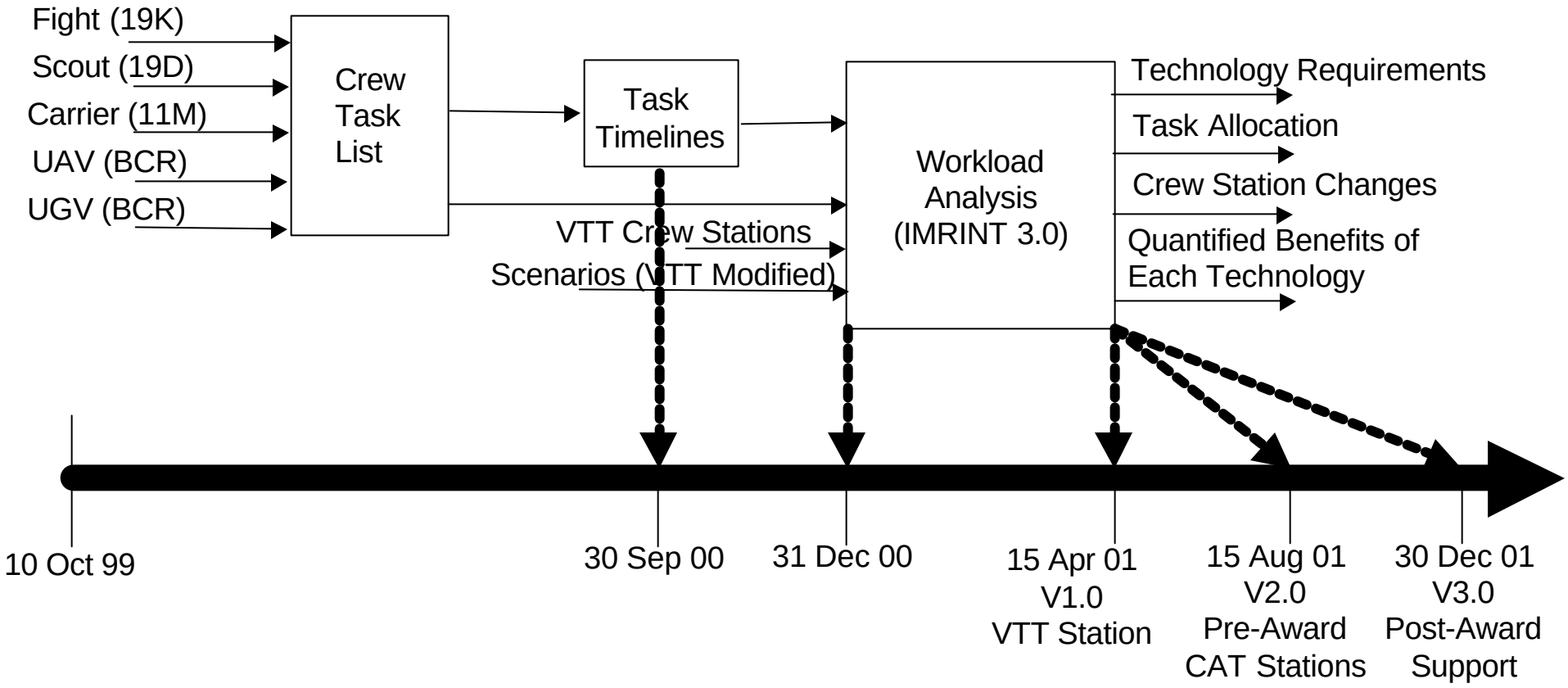
- **Enhanced performance, and survivability of the crew.**
- **Potential for reduced crew size (smaller, more transportable vehicles with lower logistics).**
- **Mission rehearsal capability**

CAT ATD Exit Criteria

- Increase crew task efficiency, or reduce the number of crew personnel.
  - Cover 100% of fight (19K), scout (19D), & carrier (11M) crew tasks with additional tasks of controlling UAV's and UGV's performed with two crew members.
- In-Vehicle crew training capability.
  - Provide mixed, live-virtual simulation of vehicle in training exercises
- Increase software reuse.
  - Package 500K SLOC for reuse through APIs
- Increase architecture performance.
  - Provide 1000 Hz control loop for critical real-time tasks

CAT Workload IPT

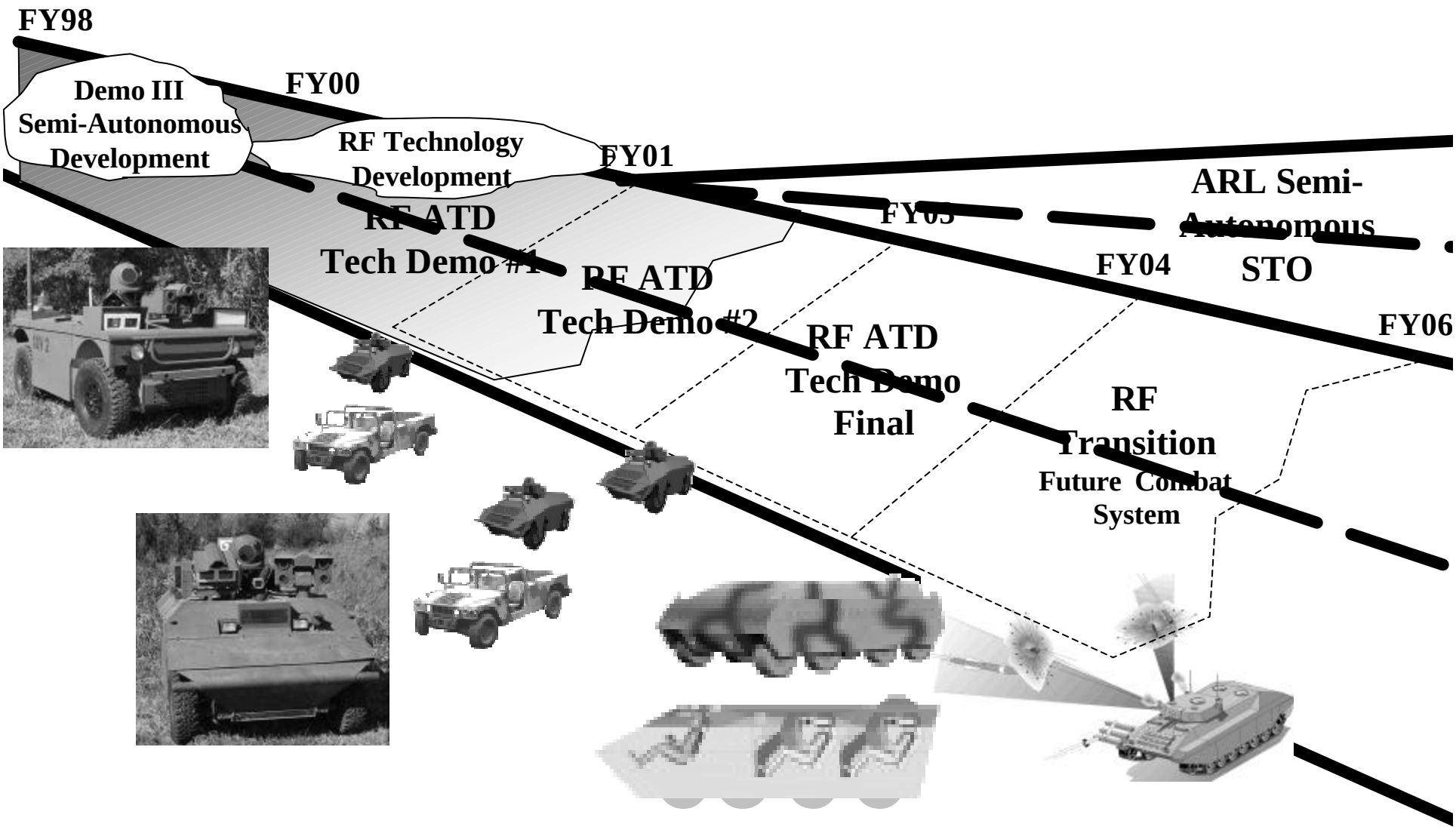
Process and Product Schedule



UAV - Unmanned Arial Vehicle

UGV - Unmanned Ground Vehicle

Robotic Follower (RF) Evolution



Robotic Follower ATD

- Objectives:
  - Develop, integrate and demonstrate the technology required to achieve unmanned follower capabilities for future land combat vehicles.
  - Maturation & demonstration of robotics technology required for early insertion into Future Combat Systems.

- Status:
  - In Year #1 of 5-Year ATD Program
  - Cooperative Program with Army Research Laboratory
  - Active Architecture IPT with STO/ATD Managers
  - Customer: TRADOC System Manager for Future Combat Systems

Robotic Follower ATD

Mature & Demonstrate Robotics Technology Required for Early Insertion into FCS

Pacing Technologies:

- Semiautonomous Perception
- Soldier-Robot Interface
- Intelligent Situational Behavior
- Leader-Follower Technology

Solution Approach

- **Manned leader "proofs" path to reduce perception & intelligence requirements**
- **Rapidly mature & integrate perception technology to enable higher speed & enhanced decision making capabilities**
- **Successively demonstrate maturing capability for FCS**

Robotic Follower Exit Criteria

Metric		Speed on Primary Road - (kph)	Speed X-Country - (kph)	Range - (km)	Max Time Delay - (hrs)	Separation - (m)	Obstacle Detection - (m)
Definition		Sustained speed on paved or improved road with firm base. Followers to stay in proper lane starting in 2003.	Open & rolling, highly trafficable for equivalent manned system.	Distance follower can travel using onboard intelligence.	Time between lead vehicle and follower vehicles crossing same piece of terrain	Distance between the lead and following vehicles, dependent on communication range and latency.	Size of non-engineered or camouflaged obstacles system can detect.
Current (Demo IIIb)		30	15	160	1	Min: 50 Max: 500	Positive: .5 Negative: 1x2x2
April, 2003[1] (XUV chassis)		55	30	160	12	Min: 20 Max: 2 km	Positive: .3 Negative: 1x2x2
END ATD	**Minimum**	65	30	160	24	Min: 10 Max: 5 km	Positive: .3 Negative: 1x2x2
	Goal	100	65	750	24	Min: 1 Max: 200 km	Positive: .3 Negative: 1x1x1

[1] Difference between achieved performance in 2003 and End ATD will be demonstrated via modeling & simulation.

Robotic Follower

Development and Test Environment